

## PATENT COOPERATION TREATY

PCT

## NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Assistant Commissioner for Patents  
United States Patent and Trademark  
Office  
Box PCT  
Washington, D.C.20231  
ETATS-UNIS D'AMERIQUE

in its capacity as elected Office

|  |   |
|--|---|
| <b>Date of mailing (day/month/year)</b><br>08 May 2000 (08.05.00)              |   |
| <b>International application No.</b><br>PCT/JP99/04662                         | <b>Applicant's or agent's file reference</b><br>NI008PCT              |
| <b>International filing date (day/month/year)</b><br>27 August 1999 (27.08.99) | <b>Priority date (day/month/year)</b><br>17 September 1998 (17.09.98) |
| <b>Applicant</b><br>TANI, Naoyuki et al  |   |

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:

12 April 2000 (12.04.00)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election
- ☒
- was

☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

|  |   |
|--|---|
| <p>The International Bureau of WIPO<br/>34, chemin des Colombettes<br/>1211 Geneva 20, Switzerland</p> <p>Facsimile No.: (41-22) 740.14.35</p> | <p>Authorized officer</p> <p>Diana Nissen</p> <p>Telephone No.: (41-22) 338.83.38</p> |
|--|---|

PCT

## REQUEST

The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty.

For Receiving Office use only

International Application No.

International Filing Date

Name of receiving Office and "PCT International Application"

Applicant's or agent's file reference  
(if desired) (12 characters maximum) NI008PCT

Box No. I TITLE OF INVENTION WORKPIECE RETAINER AND  
METHOD FOR ATTACHING/DETACHING WORKPIECE BY USING THE SAME

Box No. II APPLICANT

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

NITTA CORPORATION  
4-26, Sakuragawa 4-chome, Naniwa-ku,  
Osaka-shi, Osaka 556-0022 JAPAN

☐ This person is also inventor.Telephone No.  
06-6563-1261Facsimile No.  
06-6563-1262

Teleprinter No.

State (that is, country) of nationality:

JAPAN

State (that is, country) of residence:

JAPAN

This person is applicant  
for the purposes of:☐ all designated  
States☒ all designated States except  
the United States of America☐ the United States  
of America only☐ the States indicated in  
the Supplemental Box

Box No. III FURTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)

TANI Naoyuki  
c/o NITTA CORPORATION NARA FACTORY  
172, Ikezawa-cho, Yamatokooryama-shi,  
Nara 639-1085 JAPAN

This person is:

☐ applicant only☒ applicant and inventor☐ inventor only (If this check-box  
is marked, do not fill in below.)

State (that is, country) of nationality:

JAPAN

State (that is, country) of residence:

JAPAN

This person is applicant  
for the purposes of:☐ all designated  
States☐ all designated States except  
the United States of America☒ the United States  
of America only☐ the States indicated in  
the Supplemental Box☒ Further applicants and/or (further) inventors are indicated on a continuation sheet.

Box No. IV AGENT OR COMMON REPRESENTATIVE; OR ADDRESS FOR CORRESPONDENCE

The person identified below is hereby/has been appointed to act on behalf  
of the applicant(s) before the competent International Authorities as:

☒ agent☐ common representative

Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country.)

7828 Patent Attorney  
YAMAMOTO Shusaku  
Fifteenth Floor, Crystal Tower,  
2-27, Shiromi 1-chome, Chuo-ku,  
Osaka-shi, Osaka 540-6015 JAPAN

Telephone No.

06-6949-3910

Facsimile No.

06-6949-3915

Teleprinter No.

☐ Address for correspondence: Mark this check-box where no agent or common representative is/has been appointed and the space above is used instead to indicate a special address to which correspondence should be sent.

|   |  |  |  |
|---|--|--|--|
| Continuation of Box No. III   |  | OTHER APPLICANT(S) AND/OR (FURTHER) INVENTOR(S)  |  |
| If none of the following sub-boxes is used, this sheet should not be included in the request.   |  |  |  |
| <p>Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</p> <p><b>KASAZAKI Toshiaki</b><br/> <b>c/o NITTA CORPORATION NARA FACTORY</b><br/> <b>172, Ikezawa-cho, Yamatokooryama-shi,</b><br/> <b>Nara 639-1085 JAPAN</b></p>   |  | <p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)</p> |  |
| State (that is, country) of nationality: <b>JAPAN</b>   |  | State (that is, country) of residence: <b>JAPAN</b>  |  |
| <p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>  |  |  |  |
| <p>Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</p> <p><b>KAWAHARA Shinichiro</b><br/> <b>c/o NITTA CORPORATION NARA FACTORY</b><br/> <b>172, Ikezawa-cho, Yamatokooryama-shi,</b><br/> <b>Nara 639-1085 JAPAN</b></p> |  | <p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)</p> |  |
| State (that is, country) of nationality: <b>JAPAN</b>   |  | State (that is, country) of residence: <b>JAPAN</b>  |  |
| <p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>  |  |  |  |
| <p>Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</p> <p><b>ANDO Takashi</b><br/> <b>c/o NITTA CORPORATION NARA FACTORY</b><br/> <b>172, Ikezawa-cho, Yamatokooryama-shi,</b><br/> <b>Nara 639-1085 JAPAN</b></p>        |  | <p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)</p> |  |
| State (that is, country) of nationality: <b>JAPAN</b>   |  | State (that is, country) of residence: <b>JAPAN</b>  |  |
| <p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>  |  |  |  |
| <p>Name and address: (Family name followed by given name; for a legal entity, full official designation. The address must include postal code and name of country. The country of the address indicated in this Box is the applicant's State (that is, country) of residence if no State of residence is indicated below.)</p> <p><b>YAMAMOTO Masayoshi</b><br/> <b>c/o NITTA CORPORATION NARA FACTORY</b><br/> <b>172, Ikezawa-cho, Yamatokooryama-shi,</b><br/> <b>Nara 639-1085 JAPAN</b></p>  |  | <p>This person is:</p> <p><input type="checkbox"/> applicant only</p> <p><input checked="" type="checkbox"/> applicant and inventor</p> <p><input type="checkbox"/> inventor only (If this check-box is marked, do not fill in below.)</p> |  |
| State (that is, country) of nationality: <b>JAPAN</b>   |  | State (that is, country) of residence: <b>JAPAN</b>  |  |
| <p>This person is applicant for the purposes of: <input type="checkbox"/> all designated States <input type="checkbox"/> all designated States except the United States of America <input checked="" type="checkbox"/> the United States of America only <input type="checkbox"/> the States indicated in the Supplemental Box</p>  |  |  |  |
| <p><input type="checkbox"/> Further applicants and/or (further) inventors are indicated on another continuation sheet.</p>  |  |  |  |

Box No.V DESIGNATION OF STATES

The following designations are hereby made under Rule 4.9(a) (mark the applicable check-boxes; at least one must be marked):

Regional Patent

- ☐ AP ARIPO Patent: GH Ghana, GM Gambia, KE Kenya, LS Lesotho, MW Malawi, SD Sudan, SZ Swaziland, UG Uganda, ZW Zimbabwe, and any other State which is a Contracting State of the Harare Protocol and of the PCT
- ☐ EA Eurasian Patent: AM Armenia, AZ Azerbaijan, BY Belarus, KG Kyrgyzstan, KZ Kazakhstan, MD Republic of Moldova, RU Russian Federation, TJ Tajikistan, TM Turkmenistan, and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT
- ☒ EP European Patent: AT Austria, BE Belgium, CH and LI Switzerland and Liechtenstein, CY Cyprus, DE Germany, DK Denmark, ES Spain, FI Finland, FR France, GB United Kingdom, GR Greece, IE Ireland, IT Italy, LU Luxembourg, MC Monaco, NL Netherlands, PT Portugal, SE Sweden, and any other State which is a Contracting State of the European Patent Convention and of the PCT
- ☐ OA OAPI Patent: BF Burkina Faso, BJ Benin, CF Central African Republic, CG Congo, CI Côte d'Ivoire, CM Cameroon, GA Gabon, GN Guinea, GW Guinea-Bissau, ML Mali, MR Mauritania, NE Niger, SN Senegal, TD Chad, TG Togo, and any other State which is a member State of OAPI and a Contracting State of the PCT (if other kind of protection or treatment desired, specify on dotted line)

National Patent (if other kind of protection or treatment desired, specify on dotted line):

- |   |   |
|---|---|
| <input type="checkbox"/> AL Albania                               | <input type="checkbox"/> LS Lesotho                                   |
| <input type="checkbox"/> AM Armenia                               | <input type="checkbox"/> LT Lithuania                                 |
| <input type="checkbox"/> AT Austria                               | <input type="checkbox"/> LU Luxembourg                                |
| <input type="checkbox"/> AU Australia                             | <input type="checkbox"/> LV Latvia                                    |
| <input type="checkbox"/> AZ Azerbaijan                            | <input type="checkbox"/> MD Republic of Moldova                       |
| <input type="checkbox"/> BA Bosnia and Herzegovina                | <input type="checkbox"/> MG Madagascar                                |
| <input type="checkbox"/> BB Barbados                              | <input type="checkbox"/> MK The former Yugoslav Republic of Macedonia |
| <input type="checkbox"/> BG Bulgaria                              |   |
| <input type="checkbox"/> BR Brazil                                | <input type="checkbox"/> MN Mongolia                                  |
| <input type="checkbox"/> BY Belarus                               | <input type="checkbox"/> MW Malawi                                    |
| <input type="checkbox"/> CA Canada                                | <input type="checkbox"/> MX Mexico                                    |
| <input type="checkbox"/> CH and LI Switzerland and Liechtenstein  | <input type="checkbox"/> NO Norway                                    |
| <input type="checkbox"/> CN China                                 | <input type="checkbox"/> NZ New Zealand                               |
| <input type="checkbox"/> CU Cuba                                  | <input type="checkbox"/> PL Poland                                    |
| <input type="checkbox"/> CZ Czech Republic                        | <input type="checkbox"/> PT Portugal                                  |
| <input type="checkbox"/> DE Germany                               | <input type="checkbox"/> RO Romania                                   |
| <input type="checkbox"/> DK Denmark                               | <input type="checkbox"/> RU Russian Federation                        |
| <input type="checkbox"/> EE Estonia                               | <input type="checkbox"/> SD Sudan                                     |
| <input type="checkbox"/> ES Spain                                 | <input type="checkbox"/> SE Sweden                                    |
| <input type="checkbox"/> FI Finland                               | <input checked="" type="checkbox"/> SG Singapore                      |
| <input type="checkbox"/> GB United Kingdom                        | <input type="checkbox"/> SI Slovenia                                  |
| <input type="checkbox"/> GD Grenada                               | <input type="checkbox"/> SK Slovakia                                  |
| <input type="checkbox"/> GE Georgia                               | <input type="checkbox"/> SL Sierra Leone                              |
| <input type="checkbox"/> GH Ghana                                 | <input type="checkbox"/> TJ Tajikistan                                |
| <input type="checkbox"/> GM Gambia                                | <input type="checkbox"/> TM Turkmenistan                              |
| <input type="checkbox"/> HR Croatia                               | <input type="checkbox"/> TR Turkey                                    |
| <input type="checkbox"/> HU Hungary                               | <input type="checkbox"/> TT Trinidad and Tobago                       |
| <input type="checkbox"/> ID Indonesia                             | <input type="checkbox"/> UA Ukraine                                   |
| <input type="checkbox"/> IL Israel                                | <input type="checkbox"/> UG Uganda                                    |
| <input type="checkbox"/> IN India                                 | <input checked="" type="checkbox"/> US United States of America       |
| <input type="checkbox"/> IS Iceland                               |   |
| <input type="checkbox"/> JP Japan                                 | <input type="checkbox"/> UZ Uzbekistan                                |
| <input type="checkbox"/> KE Kenya                                 | <input type="checkbox"/> VN Viet Nam                                  |
| <input type="checkbox"/> KG Kyrgyzstan                            | <input type="checkbox"/> YU Yugoslavia                                |
| <input type="checkbox"/> KP Democratic People's Republic of Korea | <input type="checkbox"/> ZW Zimbabwe                                  |
| <input checked="" type="checkbox"/> KR Republic of Korea          |   |
| <input type="checkbox"/> KZ Kazakhstan                            |   |
| <input type="checkbox"/> LC Saint Lucia                           |   |
| <input type="checkbox"/> LK Sri Lanka                             |   |
| <input type="checkbox"/> LR Liberia                               |   |

Check-boxes reserved for designating States (for the purposes of a national patent) which have become party to the PCT after issuance of this sheet:

**Precautionary Designation Statement:** In addition to the designations made above, the applicant also makes under Rule 4.9(b) all other designations which would be permitted under the PCT except any designation(s) indicated in the Supplemental Box as being excluded from the scope of this statement. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit. (Confirmation of a designation consists of the filing of a notice specifying that designation and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.)

| Box No. VI PRIORITY CLAIMS                          |                                 |                               |                                       |   | <input type="checkbox"/> Further priority claims are indicated in the Supplemental Box. |
|---|---------------------------------|-------------------------------|---------------------------------------|---|---|
| Filing date of earlier application (day/month/year) | Number of earlier application   | Where earlier application is: |                                       |   |   |
|   |                                 | national application: country | regional application: regional Office | international application: receiving Office |   |
| item (1)<br>17.09.98                                | Patent Application<br>10-263751 | Japan                         |                                       |   |   |
| item (2)  |                                 |                               |                                       |   |   |
| item (3)  |                                 |                               |                                       |   |   |

☐ The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) (only if the earlier application was filed with the Office which for the purposes of the present international application is the receiving Office) identified above as item(s):

\* Where the earlier application is an ARIPO application, it is mandatory to indicate in the Supplemental Box at least one country party to the Paris Convention for the Protection of Industrial Property for which that earlier application was filed (Rule 4.10(b)(ii)). See Supplemental Box.

Box No. VII INTERNATIONAL SEARCHING AUTHORITY

|   |  |
|---|--|
| Choice of International Searching Authority (ISA) (if two or more International Searching Authorities are competent to carry out the international search, indicate the Authority chosen; the two-letter code may be used): | Request to use results of earlier search; reference to that search (if an earlier search has been carried out by or requested from the International Searching Authority): |
| ISA / E P   | Date (day/month/year) Number Country (or regional Office)  |

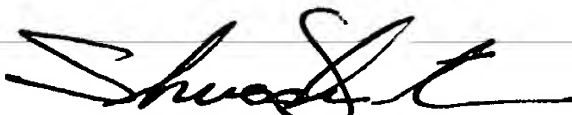
Box No. VIII CHECK LIST; LANGUAGE OF FILING

|  |   |
|--|---|
| <p>This international application contains the following number of sheets:</p> <p>request : 4</p> <p>description (excluding sequence listing part) : 30</p> <p>claims : 3</p> <p>abstract : 1</p> <p>drawings : 1</p> <p>sequence listing part of description : 0</p> <p>Total number of sheets : 39</p> | <p>This international application is accompanied by the item(s) marked below:</p> <p>1. <input checked="" type="checkbox"/> fee calculation sheet</p> <p>2. <input type="checkbox"/> separate signed power of attorney</p> <p>3. <input type="checkbox"/> copy of general power of attorney; reference number, if any:</p> <p>4. <input type="checkbox"/> statement explaining lack of signature</p> <p>5. <input type="checkbox"/> priority document(s) identified in Box No. VI as item(s):</p> <p>6. <input type="checkbox"/> translation of international application into (language):</p> <p>7. <input type="checkbox"/> separate indications concerning deposited microorganism or other biological material</p> <p>8. <input type="checkbox"/> nucleotide and/or amino acid sequence listing in computer readable form</p> <p>9. <input type="checkbox"/> other (specify):</p> |
|--|---|

|  |  |
|--|--|
| Figure of the drawings which should accompany the abstract: Fig. 1 | Language of filing of the international application: English |
|--|--|

Box No. IX SIGNATURE OF APPLICANT OR AGENT

Next to each signature, indicate the name of the person signing and the capacity in which the person signs (if such capacity is not obvious from reading the request).

  
YAMAMOTO Shusaku

|   |  |   |
|---|--|---|
| For receiving Office use only   |  | <p>2. Drawings:</p> <p><input type="checkbox"/> received:</p> <p><input type="checkbox"/> not received:</p> |
| 1. Date of actual receipt of the purported international application:   |  |   |
| 3. Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application: |  |   |
| 4. Date of timely receipt of the required corrections under PCT Article 11(2):  |  |   |
| 5. International Searching Authority (if two or more are competent): ISA / E P  | 6. <input type="checkbox"/> Transmittal of search copy delayed until search fee is paid. |   |

|   |                                   |
|---|-----------------------------------|
| Date of receipt of the record copy by the International Bureau: | For International Bureau use only |
|---|-----------------------------------|

This sheet is not part of and does not count as a sheet of the international application.

PCT

FEE CALCULATION SHEET

Annex to the Request

For receiving Office use only

International application No.

Date stamp of the receiving Office

Applicant's or agent's  
file reference

NI008PCT

Applicant

NITTA CORPORATION

CALCULATION OF PRESCRIBED FEES

1. TRANSMITTAL FEE . . . . . 18,000 T
2. SEARCH FEE . . . . . 120,000 S

International search to be carried out by . . . . .  
(If two or more International Searching Authorities are competent in relation to the international application, indicate the name of the Authority which is chosen to carry out the international search.)

3. INTERNATIONAL FEE

Basic Fee

The international application contains 39 sheets.

first 30 sheets . . . . . 54,800 b1

9 x 1,300 = 11,700 b2  
remaining sheets additional amount

Add amounts entered at b1 and b2 and enter total at B . . . . . 66,500 B

Designation Fees

The international application contains 4 designations.

4 x 12,600 = 50,400 D  
number of designation fees amount of designation fee payable (maximum 11)

Add amounts entered at B and D and enter total at I . . . . . 116,900 I

(Applicants from certain States are entitled to a reduction of 75% of the international fee. Where the applicant is (or all applicants are) so entitled, the total to be entered at I is 25% of the sum of the amounts entered at B and D.)

4. FEE FOR PRIORITY DOCUMENT (if applicable) . . . . . P

5. TOTAL FEES PAYABLE . . . . . 254,900

Add amounts entered at T, S, I and P, and enter total in the TOTAL box

TOTAL

☐ The designation fees are not paid at this time.

MODE OF PAYMENT

- ☐ authorization to charge deposit account (see below) ☐ bank draft ☐ coupons  
☐ cheque ☐ cash ☐ other (specify):  
☐ postal money order ☐ revenue stamps

DEPOSIT ACCOUNT AUTHORIZATION (this mode of payment may not be available at all receiving Offices)

- The RO/ ☐ is hereby authorized to charge the total fees indicated above to my deposit account.
- ☐ is hereby authorized to charge any deficiency or credit any overpayment in the total fees indicated above to my deposit account.
- ☐ is hereby authorized to charge the fee for preparation and transmittal of the priority document to the International Bureau of WIPO to my deposit account.

Deposit Account No.

Date (day/month/year)

Signature

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE  
COMMUNICATION OF THE INTERNATIONAL  
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:  
YAMAMOTO, Shusaku  
Crystal Tower, 15th floor  
2-27, Shiromi 1-chome  
Chuo-ku  
Osaka-shi  
Osaka 540-6015  
JAPON

RECEIVED  
APR. 10. 2000  
S. YAMAMOTO

|  |   |  |  |
|--|---|--|--|
| Date of mailing (day/month/year)<br>30 March 2000 (30.03.00) |   | IMPORTANT NOTICE   |  |
| Applicant's or agent's file reference<br>N1008PCT            |   |  |  |
| International application No.<br>PCT/JP99/04662              | International filing date (day/month/year)<br>27 August 1999 (27.08.99) | Priority date (day/month/year)<br>17 September 1998 (17.09.98) |  |
| Applicant<br>NITTA CORPORATION et al                         |   |  |  |

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:

KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

EP,SG

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 30 March 2000 (30.03.00) under No. WO 00/17284

**REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)**

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

**REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))**

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

|  |                                    |
|--|------------------------------------|
| The International Bureau of WIP<br>34, chemin des Colombettes<br>1211 Geneva 20, Switzerland | Authorized officer<br><br>J. Zahra |
| Facsimile No. (41-22) 740.14.35  | Telephone No. (41-22) 338.83.38    |



PCT

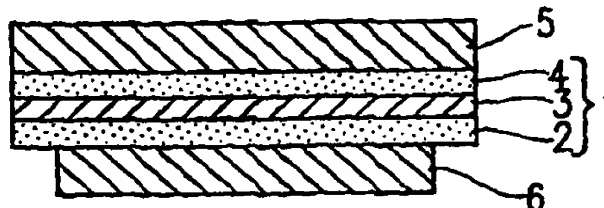
RLD INTELLECTUAL PROPERTY ORGANIZATION  
International Bureau

## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

|  |   |  |
|--|---|--|
| <b>(51) International Patent Classification <sup>7</sup> :</b><br><b>C09J 7/02, B24B 37/04, 41/06, H01L 21/68</b>  | <b>A1</b>   | <b>(11) International Publication Number:</b> <b>WO 00/17284</b><br><b>(43) International Publication Date:</b> 30 March 2000 (30.03.00) |
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**(54) Title:** WORKPIECE RETAINER AND METHOD FOR ATTACHING/DETACHING WORKPIECE BY USING THE SAME**(57) Abstract**

A workpiece retainer includes an adhesive composition containing a pressure-sensitive adhesive and a side-chain crystallizable polymer so that the side-chain crystallizable polymer is present in an amount of about 1 % to about 30 % by weight based on the adhesive composition. The side-chain crystallizable polymer includes as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain.





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## DESCRIPTION

WORKPIECE RETAINER AND  
5 METHOD FOR ATTACHING/DETACHING WORKPIECE BY USING THE SAME

## TECHNICAL FIELD

10 The present invention relates to a workpiece  
retainer which is attached to a base plate of a polishing  
machine, etc., so as to hold a workpiece (e.g., a  
semiconductor workpiece or precision glass) in place while  
the workpiece is polished, and a method for  
15 attaching/detaching a workpiece to/from the base plate of  
a polishing machine, etc., by using the workpiece retainer.

## BACKGROUND ART

20 In recent years, in the semiconductor industry, the  
integration level of ICs has rapidly increased. It has  
increased from 4M to 16M and is now proceeding to the 64M  
level.

25 In light of the above circumstances, improvement in  
the surface quality of a wafer (on which ICs are formed)  
has been demanded. In order to increase the integration  
level of ICs, it is necessary to reduce the minimum width  
30 that is allowed for devices to be mounted on the wafer, as  
well as improving the chemical and electrical properties  
of the wafer. The ideal value for the minimum width has  
shifted from about 0.5 microns to about 0.35 microns.

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In order to enable such high-precision processing, more and more stringent demands have been made on the flatness or thickness accuracy of the wafer surface. Specifically, a wafer which has been subjected to a final mirror-surface polishing process is required to have a total thickness variation (TTV) on the order of 1  $\mu\text{m}$  or less over the entire area, and a local thickness variation (LTV) on the order of 0.2  $\mu\text{m}$  or less over an area of about 20  $\text{mm}^2$  (i.e., an area generally defining a single IC chip).

In order to satisfy such accuracy requirements, it is necessary to accurately mount a given wafer to be polished on a base plate of a polishing machine so that the wafer is substantially in parallel with respect to the base plate surface.

In general, wax is used for attaching a wafer on a polishing machine base plate. This method involves applying a fused wax on the surface of a heated base plate so as to allow the wafer to be fixed on the base plate surface via the applied wax.

According to this method, a wafer is first fixed on the base plate surface to carry out a polishing process; after the polishing process is completed, the base plate is heated again to fuse the wax thereon in order to remove the wafer from the base plate surface; and the wafer is washed with an organic solvent to eliminate the wax.

Although this method can provide a satisfactory small level of thickness variation of polished wafers, this method disadvantageously requires a heating step for causing

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thermal fusing of wax, and large amounts of hazardous organic solvents for washing off the wax. Moreover, if any gelated substance or foreign particles are present in the wax, they may be transcribed as dimples on the wafer surface during the polishing process, thereby degrading the final polishing quality. Furthermore, the wafer surface may be slightly etched during the washing after polishing.

## 10 DISCLOSURE OF THE INVENTION

A workpiece retainer according to the present invention includes an adhesive composition containing a pressure-sensitive adhesive and a side-chain crystallizable polymer so that the side-chain crystallizable polymer is present in an amount of about 1% to about 30% by weight based on the adhesive composition, wherein the side-chain crystallizable polymer includes as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain.

In one embodiment of the invention, the adhesive composition contains a tackifier in an amount of about 10% to about 30% by weight; and the adhesiveness of the adhesive composition is decreased by more than about 90% when heated above about 50°C.

In another embodiment of the invention, the side-chain crystallizable polymer has a molecular weight of about 2,000 to about 15,000.

In still another embodiment of the invention, the

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adhesive composition exhibits sufficient tackiness with respect to a workpiece in a temperature range from room temperature to about 45°C, and is easily peeled off the workpiece above about 50°C.

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In still another embodiment of the invention, the side-chain crystallizable polymer has a melting point which occurs within a temperature range narrower than about 15°C.

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Alternatively, the workpiece retainer according to the present invention includes: a first pressure-sensitive adhesive layer on which a workpiece is to be attached; a support formed on a back face of the first pressure-sensitive adhesive layer; and a second pressure-sensitive adhesive layer formed on a back face of the support, wherein the first pressure-sensitive adhesive layer includes an adhesive composition, the adhesive composition containing a pressure-sensitive adhesive and a side-chain crystallizable polymer so that the side-chain crystallizable polymer is present in an amount of about 1% to about 30% by weight based on the adhesive composition, and the side-chain crystallizable polymer including as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain.

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In one embodiment of the invention, the adhesive composition contains a tackifier in an amount of about 10% to about 30% by weight; and the adhesiveness of the adhesive composition is decreased by more than about 90% when heated above about 50°C.

In another embodiment of the invention, the

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side-chain crystallizable polymer has a molecular weight of about 2,000 to about 15,000.

5 In still another embodiment of the invention, the adhesive composition exhibits sufficient tackiness with respect to a workpiece in a temperature range from room temperature to about 45°C, and is easily peeled off the workpiece above about 50°C.

10 In still another embodiment of the invention, the side-chain crystallizable polymer has a melting point which occurs within a temperature range narrower than about 15°C.

15 In another aspect of the invention, there is provided a method for attaching/detaching any of the above workpiece retainers to/from a base plate of a polishing machine, including the steps of: attaching the workpiece retainer to at least one of the workpiece and the base plate of the polishing machine maintained at temperature T1; and  
20 detaching the workpiece from the base plate by heating the workpiece retainer at temperature T2 which is higher than temperature T1.

25 The present invention provides the following effects.

According to one embodiment of the present invention, a workpiece retainer is provided which is composed essentially of an adhesive composition containing a  
30 pressure-sensitive adhesive and a side-chain crystallizable polymer, where the side-chain crystallizable polymer is present in the amount of about 1% to about 30% by weight based on the adhesive composition.

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The side-chain crystallizable polymer includes as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain. As a result, the polymer is capable of shifting between a crystal state and an amorphous state in a reversible manner, responsive to a relatively small temperature change from an arbitrarily selected ordinary temperature value; consequently, the polymer exhibits drastic a change in its tackiness to a workpiece which it is adhered to.

Thus, when the workpiece retainer is heated to a predetermined elevated temperature (e.g., about 50°C to about 100°C), the adhesiveness of the adhesive layer rapidly decreases. Therefore, at the time of peeling a workpiece from the workpiece retainer, the workpiece retainer (and/or any work substrate on which the workpiece retainer is attached, e.g., an upper base plate) may be heated so as to greatly decrease the adhesiveness of the adhesive layer with respect to the workpiece, whereby the workpiece retainer can be easily peeled off the workpiece.

In accordance with an embodiment of the invention where the adhesive composition contains a tackifier in the amount of about 10% to about 30% by weight and where the adhesiveness of the adhesive composition is decreased by more than about 90% when heated above about 50°C, a predetermined level of adhesiveness with respect to the workpiece such as a wafer can be retained at ordinary temperatures, whereas a rapid decrease in adhesion strength can be caused by heating. Thus, a tackifier present in the above-mentioned amount will not substantially influence the temperature sensitivity of the polymer. As a result, the

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adhesive composition according to the present invention exhibits a sufficient adhesion strength at ordinary temperatures, while maintaining a good balance between the adhesion strength at ordinary temperatures and the peeling force required at elevated temperatures.

Thus, the invention described herein makes possible the advantages of (1) providing a workpiece retainer which allows a workpiece to adhere strongly, stably, and precisely to a base plate of a polishing machine, and yet allows for easy detachment of the workpiece from the base plate, without requiring washing with any conventional organic solvents and/or surfactants; (2) providing a method for attaching/detaching a workpiece by using the workpiece retainer.

These and other advantages of the present invention will become apparent to those skilled in the art upon reading and understanding the following detailed description with reference to the accompanying figures.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a cross-sectional view illustrating a workpiece retainer according to one example of the present invention when attached to an upper base plate of a polishing machine, with a wafer adhered to the workpiece retainer.

Figure 2 is a cross-sectional view illustrating a workpiece retainer according to another example of the present invention when attached to an upper base plate of a polishing machine, with a wafer adhered to the workpiece



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retainer.

#### BEST MODES FOR CARRYING OUT THE INVENTION

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The workpiece retainer according to the present invention is composed essentially of an adhesive composition containing a side-chain crystallizable polymer having a melting point which occurs within a temperature range narrower than about 15°C and a pressure-sensitive adhesive. The adhesive composition exhibits adhesive properties at an ordinary temperature T1 (generally below about 40°C to 50°C), and yet exhibits much reduced adhesiveness to a workpiece or other material when heated to an elevated temperature T2 which is higher than the ordinary temperature T1 by about 15°C or more.

As shown in Figure 1, the workpiece retainer 1 of the present invention may compose a single layer upon a work substrate such as a base plate of a polishing machine. Alternatively, as shown in Figure 2, the workpiece retainer 1 may include three layers with a support interposed in the middle. As illustrated in Figure 2, the three-layered workpiece retainer may include a first pressure-sensitive adhesive layer 2 (composed of the inventive adhesive composition) formed on one face of a support sheet 3 and a second pressure-sensitive adhesive layer 4 formed on the other face of the support sheet 3.

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The second pressure-sensitive adhesive layer 4 may be composed essentially of (1) a commercially available pressure-sensitive adhesive, (2) a mixture of a commercially available pressure-sensitive adhesive and the inventive

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adhesive composition, or (3) a pressure-sensitive adhesive of a temperature-sensitive type whose adhesiveness can be reduced responsive to cooling.

5 (Pressure-sensitive Adhesive layer)

Examples of pressure-sensitive adhesives contained in the adhesive composition of the present invention include the following materials: natural rubber adhesives; styrene/butadiene latex-base adhesives; ABA block  
10 copolymer type thermoplastic rubbers (where A represents a thermoplastic polystyrene end block; and B represents a rubber intermediate block such as polyisoprene, polybutadiene or poly(ethylene/butylene)); butyl rubber; polyisobutylene; acrylic adhesives such as polyacrylate and  
15 vinyl acetate/acryl ester copolymer; and vinyl ether copolymers such as polyvinylmethylether, polyvinylethylether, and polyvinylisobutylether.

Especially preferable are acryl type pressure-sensitive adhesives composed essentially of ethylhexyl  
20 acrylate, hydroxyethyl acrylate, or the like. The use of acryl type pressure-sensitive adhesives provides interaction with the polymer such that the polymer will so be sufficiently dispersed within the adhesive layer at a  
25 predetermined temperature so as to exhibit sufficient tackiness, and yet that the polymer will easily bleed out when heated to a temperature above the predetermined temperature.

30 (Side-chain Crystallizable Polymer)

As a side-chain crystallizable polymer to be contained in the adhesive composition, those which have a melting point which occurs within a temperature range

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narrower than about 15°C (also referred to as "first-order melting transition") are preferably used. An adhesive composition containing such a polymer is disclosed in Japanese National Phase PCT Laid-open Publication No. 6-510548.

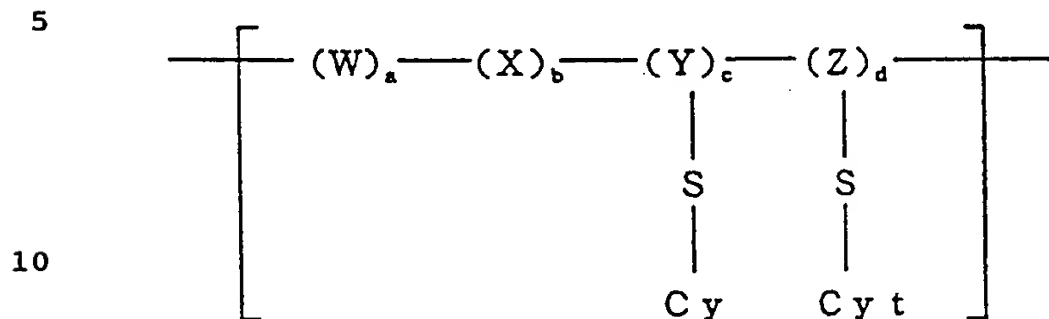
As used herein, the term "melting point" means the temperature at which an equilibrium process causes certain portions of a polymer, initially aligned in an ordered array, to become disordered. In one embodiment, preferably, the melting point of the polymer is in the range of about 40°C to about 100°C, more preferably in the range of about 40°C to 60°C. It is preferable that the melting occur rapidly, i.e., over a relatively narrow temperature range which is less than about 10°C and preferably less than about 5°C. It is preferable that the polymer crystallizes rapidly. To this end, seeding agents, or crystallization catalysts can be incorporated into the polymer.

After use, the workpiece retainer according to the present invention can be readily peeled off the surface of the polishing machine base plate by simply heating the workpiece retainer to a temperature (hereinafter referred to as an "elevated temperature") which is slightly higher than the use temperature. The elevated temperature is usually about 40°C to about 100°C, preferably about 40°C to about 70°C, and more preferably about 50°C to about 70°C.

The present invention is based on the finding that it is possible to obtain an adhesive composition whose adhesiveness controllably varies with temperature by mixing a crystallizable polymer of certain physicochemical properties with a pressure-sensitive adhesive.

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The most preferable side-chain crystallizable polymer to be used according to the present invention contains repeating units of the formula below:



....(I)

15 In formula (I), W and X represent first and second monomer units, respectively, each of which may be any molecular moiety connectable to an adjoining molecular moiety (i.e., polymerizable). Y and Z each independently represent a backbone monomer unit which may be any molecular moiety or atom. Each S independently represents a linking group or spacer unit which may optionally be present. Cyt and Cy each independently represent a crystallizable moiety which is connected to the respective backbone either directly or via the spacer unit. Variables a, b, c, and d

20 each independently represent an integer in the range of 0 to 1,000 with the proviso that sufficient Cyt and Cy are present so as to provide a molecular weight which is equal to or greater than twice the sum of the molecular weights of W, X, Y and Z. The polymers have a heat of fusion ( $\Delta H_f$ ) of at least about 20 Joules/g. In the case where variables a, b, c, and d are all greater than 1, monomer units W, X, Y, and Z each define a repeating unit or a mixture of different monomer units. For example, in the case where

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a is 100, W may be a 5:5:2:5:83 mixture of styrene, acrylic acid, methylstyrene, and hexadecylacrylate. Accordingly, any of monomer units W, X, Y, and Z may be a mixture of polymerizable monomers.

5

The adhesive composition according to the present invention may optionally be cross-linked. Cross-linking may be effected by any known technique, such as using a cross-linking agent, heating, or radiation.

10

The backbone of the polymer (represented as W, X, Y, and Z in formula (I)) may be any organic structure (aliphatic or aromatic hydrocarbon, ester, ether, amide, etc.) or an inorganic structure (sulfide, phosphazine, silicone, etc.). The spacer linkages can be any suitable organic or inorganic units, for example, ester, amide, hydrocarbon, phenyl, ether, or inorganic salt (e.g., a carboxyl-alkyl ammonium or sulphonium or phosphonium ion pair, or other known ionic salt pair). The side-chain (represented as Cyt and Cy, and an optionally present S in formula (I)) may be aliphatic or aromatic, or a combination of aliphatic side-chains of at least 10 carbon atoms, fluorinated aliphatic side-chains of at least 6 carbon atoms, and p-alkyl styrene side-chains wherein the alkyl group contains 8 to 24 carbon atoms.

25

The length of each side-chain moiety is usually greater than about 5 times the distance between side-chains in the case of acrylates, methacrylates, vinyl esters, acrylamides, methacrylamides, vinyl ethers, and alpha olefins. In the extreme case of a fluoroacrylate alternate copolymer with butadiene, a side-chain can be as little as 2 times the length of the distance between branches. In any

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case, the side-chain unit should account for more than about 50% of the volume of the polymer, preferably greater than about 65% of the volume. Co-monomers added to a side-chain polymer usually have an adverse effect on crystallinity. Small amounts (usually about 10% to about 25% by volume) of various comonomers can be tolerated. In some cases, it may be preferable to add a small amount of comonomer, e.g., a cure site monomer such as acrylic acid, glycidal methacrylate, maleic anhydride, an amino functional monomer, and the like.

Examples of side-chain crystallizable monomers which fall within the above-described categories include acrylate, fluoroacrylate, methacrylate and vinyl ester polymers such as those described in J. Poly. Sci. 10: 3347 (1972); J. Poly. Sci. 10: 1657 (1972); J. Poly. Sci. 9: 3367 (1971); J. Poly. Sci. 9: 3349 (1971); J. Poly. Sci. 9: 1835 (1971); J.A.C.S. 76: 6280 (1954); J. Poly. Sci. 7: 3053 (1969); J. Poly. Sci. 17: 991 (1985), corresponding acrylamides, substituted acrylamide and maleimide polymers (J. Poly. Sci.: Poly. Physics Ed. 18: 2197 (1980); poly( $\alpha$ -olefin) polymers such as those described in J. Poly. Sci.: Macromol. Rev. 8: 117-252 (1974) and Macromolecules 13: 12 (1980), polyalkyl-vinylethers, polyalkylethylene oxides such as those described in Macromolecules 13: 15 (1980), alkylphosphazene polymers, polyamino acids such as those described in J. Poly. Sci. USSR 21: 241 (1979), Macromolecules 18: 2141(1985), polyisocyanates such as those described in Macromolecules 12: 94 (1979), polyurethanes made by reacting amine- or alcohol-containing monomers with long-chain alkyl isocyanates, polyesters and polyethers, polysiloxanes and polysilanes such as those described in Macromolecules 19: 611 (1986), and p-

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alkylstyrene polymers such as those described in J.A.C.S. 75: 3326 (1953), and triglycerides such as tristearin or pentaerythritol tetrastearate.

5                    Particularly preferable side-chain crystallizable polymers to be used for the present invention include linear aliphatic C14-C50 (having 14 to 50 carbon atoms) polyacrylates, linear aliphatic C14-C50 polymethacrylates, linear aliphatic C14-C50 polyacrylamides, and linear  
10 aliphatic C14-C50 polymethacrylamides. Especially preferable among these are linear aliphatic C16-C22 polyacrylates, linear aliphatic C16-C22 polymethacrylates, linear aliphatic C16-C22 polyacrylamides, and linear aliphatic C16-C22 polymethacrylamides.

15                    As described above, the melting point of the selected crystallizable polymer defines a use temperature range, within which the composition exhibits tackiness. The amount of the crystallizable polymer incorporated in  
20 the adhesive composition has surprisingly little effect on the position or the breadth of this range.

                  The transition temperatures of some selected side-chain crystallizable polymers are listed below:

25

| polymer          | transition temperature (°C) |
|------------------|-----------------------------|
| C16 acrylate     | 36                          |
| C16 methacrylate | 26                          |
| 30 C18 acrylate  | 49                          |
| C18 methacrylate | 39                          |
| C20 acrylate     | 60                          |
| C20 methacrylate | 50                          |

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|                  |    |
|------------------|----|
| C22 acrylate     | 71 |
| C22 methacrylate | 62 |

See E. F. Jordan et al. "SIDE-CHAIN CRYSTALLIZATION  
5 DEGREE II", J. Poly. Sci. Section A-1, 9: 33551 (1971).  
Examples in this literature describe a method for producing  
a crystallizable polymer in detail.

10 The molecular weight of the crystallizable polymer  
to be used is an important factor that determines the manner  
in which the adhesive composition of the present invention  
exhibits temperature-dependent tackiness and/or adhesion  
strength. Specifically, a low molecular weight  
15 crystallizable polymer will advantageously lose bonding  
strength when heated. If such property is desirable, the  
molecular weight of the polymer is preferably in the range  
of 2,000 to 15,000, and more preferably in the range of 3,000  
to 10,000.

20 The adhesive compositions useful for the present  
invention may contain, in addition to one or more of the  
polymers described above, conventional additives such as  
tackifiers (wood rosin, polyesters, etc.), antioxidants,  
fibrous or non-fibrous fillers, colorants, and the like.  
25 It is also possible to include additional adhesives in the  
adhesive composition so long as the overall temperature  
sensitivity profile is not significantly affected thereby.  
The amount of crystallizable polymer in the adhesive  
composition is preferably in the range of about 1% by weight  
30 to about 30% by weight, more preferably in the range of about  
5% by weight to about 20% by weight, and in particular in  
the range of about 5% by weight to about 15% by weight. If  
the polymer content in the adhesive composition is less than



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about 1% by weight or more than about 30% by weight, the above-described effects of the polymer may not be exhibited.

5       The adhesive compositions of the present invention may be prepared by admixing a pressure-sensitive adhesive and a crystallizable polymer in a compatible solvent and adding optional components thereto, e.g., a plasticizer, a tackifier, and/or a filler. The solid contents are adjusted to the desired viscosity, and the mixture is blended  
10       until it is homogeneous. After blending, bubbles are removed from the mixture.

      Examples of tackifiers include special rosin ester type tackifiers, terpene phenol type tackifiers, petroleum  
15       resin type tackifiers, high hydroxyl value rosin ester type tackifiers, hydrogenated rosin ester type tackifiers, and the like. Examples of commercial products include a special rosin ester type tackifier designated Super Ester A125 (Arakawa Chemical K.K.), a terpene phenol type tackifier  
20       designated Tamanoru 803L (Arakawa Chemical K.K.), a petroleum resin type tackifier designated Hiresin #90S (Toho Chemical Industry Co. Ltd.), a high hydroxyl value rosin ester type tackifier designated KE-364C (Arakawa Chemical K.K.), and a hydrogenated rosin ester type tackifier  
25       designated Estergum HD (Arakawa Chemical K.K.).

      Particularly preferable are, special rosin ester type tackifiers. The amount of a tackifier to be added is preferably in the range of about 10% to about 30% by weight,  
30       more preferably about 15% to about 25%, based on the adhesive composition. If the tackifier content is less than about 10% by weight, sufficient adhesion strength may not be attained at ordinary temperatures. If the tackifier

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content is more than about 30% by weight, the rate of decrease of adhesion strength may not be sufficient at the time of peeling.

5                   Preferable examples of a polymer contained in the adhesive composition include the following:

10                   (1) a copolymer of 80 to 98 parts by weight of stearyl acrylate, 2 to 20 parts by weight of acrylic acid, and 2 to 10 parts by weight of dodecylmercaptan;

15                   (2) a copolymer of 5 to 90 parts by weight of dococyl acrylate, 5 to 90 parts by weight of stearyl acrylate, 1 to 10 parts by weight of acrylic acid, and 2 to 10 parts by weight of dodecylmercaptan; and

20                   (3) a copolymer of 80 to 98 parts by weight of dococyl acrylate, 2 to 20 parts by weight of acrylic acid, and 2 to 10 parts by weight of dodecylmercaptan.

25                   Examples of pressure-sensitive adhesives to be contained in the adhesive composition include a copolymer containing 80 to 95 parts by weight of 2-ethylhexyl acrylate and 5 to 20 parts by weight of 2-hydroxyethyl acrylate.

25                   (Support sheet)

30                   As the support sheet 3, various synthetic resin sheets can be used, e.g., polyethylene terephthalate, polyether imide, or polyurethane. For example, a polyester film designated "Lumirror" (manufactured by Toray Industries, Inc.) may be used.

A number of methods can be used to provide the

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adhesive composition of the invention on a work substrate (such as a base plate of a polishing machine) or on a workpiece, e.g., spray deposition, painting, dipping, gravure printing, rolling or the like. The polymer composition may also be transferred from a release sheet, as in the manner of transfer printing. The composition may be applied neat (i.e., without anything else), or in a suitable solvent, or as an emulsion or latex. Alternatively, a mixture of appropriate monomers and additives may be applied directly to a substrate and cured in situ by heat, irradiation, or other suitable processes known in the art.

In the case of composing the workpiece retainer of three or more layers, the above-described pressure-sensitive adhesive layer may be laminated on one or both faces of a support, and a second pressure-sensitive adhesive layer may be laminated on the other face of the support. The pressure-sensitive adhesive used for the inventive pressure-sensitive adhesive layer may be used as the second pressure-sensitive adhesive, for example; however, any commercially available adhesive, in particular a rubber type adhesive, an acrylic type adhesive, or a semi-hotmelt adhesive can be used as the second pressure-sensitive adhesive.

(Method for attaching/detaching a workpiece)

By using the workpiece retainer of the present invention, the attachment/detachment of a workpiece to/from a base plate of a polishing machine can be performed as follows, for example.

First, the polishing machine base plate is removed and cleaned. The workpiece retainer may be applied on the

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base plate by means of a spin-coater. In the case of processing a plate-like workpiece, the workpiece retainer may be similarly applied on the workpiece by means of a spin-coater. Next, either the workpiece or the base plate, or both, is pressed onto the workpiece retainer at an ordinary temperature (e.g., about 20°C to 30°C). In the case of polishing a semiconductor wafer, it is preferable to slightly warp the workpiece retainer and gently press it against the workpiece so that its central portion contacts the workpiece first.

After attaching a workpiece on a polishing machine base plate in any of the above-described manners for a desired process of the workpiece, the workpiece may be removed by heating the base plate carrying the workpiece retainer attached thereon to an elevated temperature above about 50°C, for example. Following heating methods can be used, for example:

(1) Methods for heating the workpiece retainer

These methods may involve application of a heated iron, hot water, a heater sheet, hot air (e.g., from an air heater or a drier), steam, radiofrequency heating, and/or irradiation (infrared or far-infrared) by means of a lamp, for example.

(2) Methods for applying heat at the interface between the workpiece retainer and the base plate

These methods may involve application of a heated trowel, a heated iron, hot air (e.g., from an air heater or a drier), hot water, steam, and/or irradiation (infrared or far-infrared) by means of a lamp, for example.

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### (3) Methods for heating the base plate

5           These methods involve storing the base plate in an isothermal room kept at about 50°C to about 100°C, or immersing the base plate in hot water kept at about 50°C or above. Thereafter, the heated workpiece retainer can be peeled off the base plate. Since the peeling force at the elevated temperature is decreased to about 0.1 to about 10   0.5 Kg/inch width, the workpiece retainer of the present invention can be easily peeled off the base plate surface. The peeling of the workpiece retainer may be performed manually.

15           The polymer composition containing polymers exhibiting the above-defined temperature-dependent adhesion profile can be utilized for a workpiece retainer for polishing lenses, prisms or other precision-ground glass articles. Alternatively, it is possible to previously 20   apply the polymer composition to a small but uniform thickness on a thin substrate sheet, peel the substrate sheet off the polymer composition, and adhere and secure the polymer composition onto a workpiece.

25           By attaching a workpiece on a base plate by means of the workpiece retainer of the invention (temperature-dependent pressure-sensitive retainer) containing polymers exhibiting the above-defined temperature-dependent adhesion profile, the washing step 30   following a polishing process, if any, can be remarkably facilitated, and the quality of the processed surface can be remarkably facilitated as compared to employing a conventional wax or pressure-sensitive adhesive.

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Hereinafter, the present invention will be specifically described by way of illustrative examples. In the following description, any reference to "part(s)" means  
5 "part(s) by weight".

#### A. Preparation of polymer

##### (Synthesis Example 1)

10 First, 95 parts of stearyl acrylate, 5 parts of acrylic acid, 5 parts of dodecylmercaptan, and 1 part of Kayaester HP-70 (Kayaku Akzo K.K.) were mixed. The mixture was stirred at about 80°C for about 5 hours to polymerize these monomers. The resultant polymer had a molecular  
15 weight of about 8,000, and a melting point of about 50°C.

##### (Synthesis Example 2)

First, 92 parts of 2-ethylhexyl acrylate, 8 parts of hydroxyethyl acrylate, and 0.3 parts of Trigonox 23-  
20 C70 (Kayaku Akzo K.K.) were mixed in 150 parts of ethyl acetate/heptane (70/30). The mixture was stirred at 55°C for 3 hours and heated to about 80°C, and 0.5 parts of Kayaester HP-70 was added. The mixture was stirred for about 2 hours to polymerize these monomers. The resultant  
25 polymer had a molecular weight of about 600,000.

#### B. Preparation of a workpiece retainer

##### (Example 1)

30 The polymers obtained in accordance with Synthesis Examples 1 and 2 were mixed at a ratio of 10: 100 parts. To the resultant polymer solution, a cross-linking agent designated Coronate L45 (Nippon Polyurethane Industry Co.,

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Ltd.) was added so that 0.3 parts of Coronate L45 was present against 100 parts of the polymer of Synthesis Example 2. As shown in Figure 2, the resultant mixture was coated on both faces of a support 3 (a PET film manufactured by Somar Co.) so as to have a dry thickness of about 40  $\mu\text{m}$ , thereby forming an double-sided adhesive tape.

As a workpiece retainer 1, the double-sided adhesive tape was attached to a ceramic base plate 5 of a polishing machine. A silicon wafer 6 (diameter: about 8 inches) was directly attached to the workpiece retainer 1 at an adhesion temperature of about 25°C. Thereafter, the wafer was subjected to a polishing under the polishing conditions described in Table 1. After the polishing was finished, the wafer attached to the ceramic carrier was held under a flow of pure water heated to about 60°C for about 5 minutes, whereby the wafer was peeled off the ceramic carrier. Thereafter, it was confirmed by eyesight that no substantial artifacts of residual organic matter had been left on the wafer back face. The double-sided adhesive tape peeled off the ceramic upper base plate with a maximum peeling force of about 1.3 Kg.

(Example 2)

A polymer mixture was prepared in the same manner as in Example 1 except that the cross-linking agent Coronate L45 (Nippon Polyurethane Industry Co., Ltd.) was added so that 0.5 parts of Coronate L45 was present against 100 parts of the polymer of Synthesis Example 2. The polymer mixture was directly coated on a ceramic carrier of a polishing machine so as to have a thickness of about 0.02  $\mu\text{m}$  by means of a spin-coater, thereby forming a workpiece retainer. A silicon wafer was attached to the

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workpiece retainer at an adhesion temperature of about 25°C. Thereafter, the wafer was subjected to a polishing under the polishing conditions described in Table 1. After the polishing was finished, the wafer attached to the ceramic carrier was held under a flow of pure water heated to about 60°C for about 5 minutes, whereby the wafer was peeled off the ceramic carrier. Thereafter, it was confirmed by eyesight that no substantial artifacts of residual organic matter had been left on the wafer back face.

(Example 3)

A double-sided adhesive tape was produced in the same manner as in Example 1 except that Superester A125 (Arakawa Chemical K.K.) was added as a tackifier in the amount of about 20% by weight based on the polymer of Synthesis Example 1.

Next, using the resultant double-sided adhesive tape, the wafer was subjected to the same polishing test as in Example 1. After the polishing was finished, the wafer attached to the ceramic carrier was held under a flow of pure water heated to about 60°C for about 5 minutes, whereby the wafer was peeled off the ceramic carrier. Thereafter, no substantial clouding due to residual organic matter was observed on the back face of the silicon wafer.

(Example 4)

The double-side adhesive tape used in Example 3 was directly attached to a 20 mm×20 mm prism (manufactured by BK7), and press-attached to an upper base plate of a polishing machine at an adhesion temperature of about 25°C. Thereafter, the prism was subjected to a polishing under the polishing conditions described in Table 2. After the



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polishing was finished, the prism attached to the upper base plate was held under a flow of pure water heated to about 60°C for about 5 minutes, whereby the wafer was peeled off the upper base plate. Thereafter, the light transmittance measurement of this prism showed a sufficiently high value.

(Example 5)

First, 45 parts of cetyl acrylate, 50 parts of methylacrylate, 5 parts of acrylic acid, and 0.5 parts of azobisisobutyronitrile were mixed in toluene. The mixture was stirred at about 60°C for 10 hours under a nitrogen atmosphere to polymerize these monomers. The resultant polymer had a molecular weight of about 700,000. The transition temperature of the resultant polymer from a non-tacky state to a tacky state was in the range of about 10°C to about 20°C. The polymer exhibited no finger-felt tackiness below about 10°C, indicative of extremely low adhesiveness.

A double-sided adhesive tape was produced in the same manner as in Example 1 except that the pressure-sensitive adhesive layer 4 was formed by coating the above-described polymer so as to have a dry thickness of about 45 µm (Figure 2).

Next, by using the resultant double-sided adhesive tape, the same polishing test as in Example 1 was performed. After the polishing was finished, in a manner similar to Example 1, the wafer 6 attached to the ceramic carrier 5 was held under a flow of pure water heated to about 60°C for about 5 minutes, whereby the wafer 6 was peeled off the ceramic carrier 5. At this point, the base plate 5 and the pressure-sensitive adhesive layer 4 were well-adhered,

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whereas the pressure-sensitive adhesive layer 2 easily peeled at the interface with the silicon wafer 6. Thereafter, no substantial clouding was observed on the back face of the silicon wafer. By further cooling the base plate 5 to about 5°C, the pressure-sensitive adhesive layer 4 easily peeled off the base plate 5.

(Example 6)

A double-sided adhesive tape was produced in the same manner as in Example 1 except that the pressure-sensitive adhesive layer 4 was formed by coating a commercially available rubber type adhesive (NO-TAPE Industrial Co., Ltd.) so as to have a dry thickness of about 45 µm (Figure 2).

Next, by using the resultant double-sided adhesive tape, the same polishing test as in Example 1 was performed. After the polishing was finished, in a manner similar to Example 1, the wafer 6 attached to the ceramic carrier 5 was held under a flow of pure water heated to about 60°C for about 5 minutes, whereby the wafer 6 was peeled off the ceramic carrier 5. At this point, the pressure-sensitive adhesive layer 2 easily peeled at the interface with the silicon wafer 6. Thereafter, no substantial clouding was observed on the back face of the silicon wafer.

Furthermore, a silicon wafer was attached to the pressure-sensitive adhesive layer 2, and the same polishing test as in Example 1 was performed. Thereafter, the silicon wafer was peeled while being heated. At this point, the base plate 5 and the pressure-sensitive adhesive layer 4 were well-adhered, whereas the pressure-sensitive adhesive layer 2 easily peeled at the interface with the silicon

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wafer 6.

A series of processes consisting of attachment of a silicon wafer, a polishing test, heating, and peeling was repeated three times. The silicon wafer did not peel off the pressure-sensitive adhesive layer 2 during the polishing test, indicative of practically satisfactory adhesiveness. No substantial clouding was observed on the back face of the silicon wafer.

(Comparative Example 1)

A polishing test was performed under the same conditions as in Example 1 except for using a double-sided adhesive tape ST442 (Sumitomo 3M Ltd.) instead of the double-sided adhesive tape according to Example 1.

After the polishing test was finished, it was difficult to peel the wafer. The double-sided adhesive tape peeled off the ceramic upper base plate with a maximum peeling force of about 14.3 Kg.

(Comparative Example 2)

As in Example 2, a water-soluble wax for semiconductor wafers (viscosity: 10 cps; solid content: 10%) was directly coated on a ceramic carrier of a polishing machine so as to have a thickness of about 0.20  $\mu\text{m}$  by means of a spin-coater, and a silicon wafer was attached to this composite at an adhesion temperature of about 80  $^{\circ}\text{C}$ . Thereafter, the wafer was subjected to a polishing under the polishing conditions described in Table 1. After the polishing was finished, the wafer attached to the ceramic carrier was peeled by means of a pick, and then washed with pure water. An eyesight inspection of the residual organic

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matter on the wafer back face revealed the presence of residual wax, indicative of the need to wash the wafer with an organic solvent.

5 (Comparative Example 3)

A commercially available rosin wax (viscosity: 100 cps; solid content: 50%) was directly applied on a 20 mm × 20 mm prism (manufactured by BK7), and press-attached to an upper base plate of a polishing machine at an adhesion temperature of about 100°C. Thereafter, the prism was subjected to a polishing under the polishing conditions described in Table 2. After the polishing was finished, the prism attached to the upper base plate was heated so as to be peeled off the upper base plate. Thereafter, the light transmittance measurement of this prism showed a very low value due to the presence of a large amount of residual wax, indicative of the need to wash the prism.

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Table 1

|                       |   |
|-----------------------|---|
| Polishing machine     | Speed fam Single-side polishing machine (59SPAW) with a base plate      |
| Wafer to be processed | Silicon monocrystal P (100) wafer (diameter: 8 inches)                  |
| Polishing cloth       | SUBA800   |
| Polishing slurry      | NALCO2350; diluted by 20 times (manufactured by Nalco Chemical Company) |
| Processing pressure   | 300 g/cm <sup>2</sup>   |
| Slurry flow rate      | 1000 ml/min.  |
| Processing time       | 30 min.   |

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Table 2

|                                    |   |
|------------------------------------|---|
| Polishing machine                  | Speed fam Single-side polishing machine (26B) with a base plate |
| workpiece retainer to be processed | prism (manufactured by BK7; 20 mm × 20 mm)                      |
| Polishing cloth                    | MH C14A-15  |
| Polishing slurry                   | cerium oxide, Mireku S0; 20 wt%                                 |
| Processing pressure                | 150 g/cm <sup>2</sup>   |
| Slurry flow rate                   | 500 ml/min. (used with circulation)                             |
| Processing time                    | 20 min.   |

## INDUSTRIAL APPLICABILITY

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Thus, according to the present invention, it is possible to adjust the tackiness of a workpiece retainer with respect to a workpiece simply by changing the temperature of the workpiece retainer. As a result, it is possible to adhere a workpiece strongly, stably, and precisely to a base plate of a polishing machine during

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polishing by maintaining the workpiece retainer at a temperature (which may usually be room temperature) at which it exhibits satisfactory tackiness, whereas it is still easy to detach the workpiece from the base plate by appropriately heating the workpiece retainer. Thus, the workpiece is protected from contamination and/or etching due to organic solvents and/or surfactants as in the prior art, thereby providing for high-quality final polishing state.

Furthermore, the exchanging or replacement of a workpiece retainer according to the present invention, conducted after each polishing process, is facilitated because the workpiece retainer can be easily peeled off a base plate surface simply through temperature adjustment.

Since the tackiness of the workpiece retainer according to the present invention with respect to the workpiece can be changed in a reversible manner simply through temperature adjustment, it is possible to repetitively attach and detach a workpiece to and from the workpiece retainer. For example, it is possible to subject silicon wafers to repetitive polishing processes on a workpiece retainer affixed to a base plate.

Various other modifications will be apparent to and can be readily made by those skilled in the art without departing from the scope and spirit of this invention. Accordingly, it is not intended that the scope of the claims appended hereto be limited to the description as set forth herein, but rather that the claims be broadly construed.

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## CLAIMS

1. A workpiece retainer comprising an adhesive composition containing a pressure-sensitive adhesive and a side-chain crystallizable polymer so that the side-chain crystallizable polymer is present in an amount of about 1% to about 30% by weight based on the adhesive composition, wherein the side-chain crystallizable polymer includes as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain.
2. A workpiece retainer according to claim 1, wherein the adhesive composition contains a tackifier in an amount of about 10% to about 30% by weight; and wherein adhesiveness of the adhesive composition is decreased by more than about 90% when heated above about 50°C.
3. A workpiece retainer according to claim 1, wherein the side-chain crystallizable polymer has a molecular weight of about 2,000 to about 15,000.
4. A workpiece retainer according to claim 1, wherein the adhesive composition exhibits sufficient tackiness with respect to a workpiece in a temperature range from room temperature to about 45°C, and is easily peeled off the workpiece above about 50°C.
5. A workpiece retainer according to claim 1, wherein the side-chain crystallizable polymer has a melting point which occurs within a temperature range narrower than about 15°C.



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6. A workpiece retainer comprising:

a first pressure-sensitive adhesive layer on which a workpiece is to be attached;

5 a support formed on a back face of the first pressure-sensitive adhesive layer; and

a second pressure-sensitive adhesive layer formed on a back face of the support,

wherein the first pressure-sensitive adhesive layer comprises an adhesive composition,

10 the adhesive composition containing a pressure-sensitive adhesive and a side-chain crystallizable polymer so that the side-chain crystallizable polymer is present in an amount of about 1% to about 30% by weight based on the adhesive composition, and

15 the side-chain crystallizable polymer including as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain.

20 7. A workpiece retainer according to claim 6,

wherein the adhesive composition contains a tackifier in an amount of about 10% to about 30% by weight; and

25 wherein adhesiveness of the adhesive composition is decreased by more than about 90% when heated above about 50°C.

8. A workpiece retainer according to claim 6, wherein the side-chain crystallizable polymer has a molecular weight of about 2,000 to about 15,000.

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9. A workpiece retainer according to claim 6,

wherein the adhesive composition exhibits sufficient tackiness with respect to a workpiece in a temperature range

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from room temperature to about 45°C, and is easily peeled off the workpiece above about 50°C.

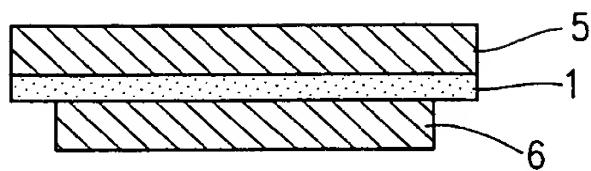
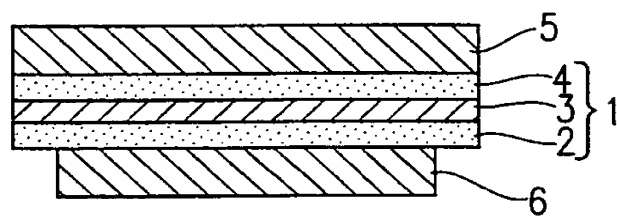
5 10. A workpiece retainer according to claim 6, wherein the side-chain crystallizable polymer has a melting point which occurs within a temperature range narrower than about 15°C.

10 11. A method for attaching/detaching a workpiece retainer according to claim 6 to/from a base plate of a polishing machine, comprising the steps of:

attaching the workpiece retainer to at least one of the workpiece and the base plate of the polishing machine maintained at temperature T1; and

15 detaching the workpiece from the base plate by heating the workpiece retainer at temperature T2 which is higher than temperature T1.

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*FIG. 1**FIG. 2*

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## CLAIMS

1. A workpiece retainer comprising an adhesive composition containing a pressure-sensitive adhesive and a side-chain crystallizable polymer so that the side-chain crystallizable polymer is present in an amount of about 1% to about 30% by weight based on the adhesive composition, wherein the side-chain crystallizable polymer includes as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain.
2. A workpiece retainer according to claim 1, wherein the adhesive composition contains a tackifier in an amount of about 10% to about 30% by weight; and wherein adhesiveness of the adhesive composition is decreased by more than about 90% when heated above about 50°C.
3. A workpiece retainer according to claim 1, wherein the side-chain crystallizable polymer has a molecular weight of about 2,000 to about 15,000.
4. A workpiece retainer according to claim 1, wherein the adhesive composition exhibits sufficient tackiness with respect to a workpiece in a temperature range from room temperature to about 45°C, and is easily peeled off the workpiece above about 50°C.
5. A workpiece retainer according to claim 1, wherein the side-chain crystallizable polymer has a melting point which occurs within a temperature range narrower than about 15°C.

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6. A workpiece retainer comprising:

a first pressure-sensitive adhesive layer on which a workpiece is to be attached;

5 a support formed on a back face of the first pressure-sensitive adhesive layer; and

a second pressure-sensitive adhesive layer formed on a back face of the support,

wherein the first pressure-sensitive adhesive layer comprises an adhesive composition,

10 the adhesive composition containing a pressure-sensitive adhesive and a side-chain crystallizable polymer so that the side-chain crystallizable polymer is present in an amount of about 1% to about 30% by weight based on the adhesive composition, and

15 the side-chain crystallizable polymer including as a main component thereof an acrylic acid ester and/or methacrylic acid ester which has a straight-chain alkyl group including 16 or more carbon atoms as a side chain.

20 7. A workpiece retainer according to claim 6,

wherein the adhesive composition contains a tackifier in an amount of about 10% to about 30% by weight; and

25 wherein adhesiveness of the adhesive composition is decreased by more than about 90% when heated above about 50°C.

8. A workpiece retainer according to claim 6, wherein the side-chain crystallizable polymer has a molecular weight of about 2,000 to about 15,000.

30

9. A workpiece retainer according to claim 6,

wherein the adhesive composition exhibits sufficient tackiness with respect to a workpiece in a temperature range

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from room temperature to about 45°C, and is easily peeled off the workpiece above about 50°C.

5 10. A workpiece retainer according to claim 6, wherein the side-chain crystallizable polymer has a melting point which occurs within a temperature range narrower than about 15°C.

10 11. A method for attaching/detaching a workpiece retainer according to claim 6 to/from a base plate of a polishing machine, comprising the steps of:

attaching the workpiece retainer to at least one of the workpiece and the base plate of the polishing machine maintained at temperature T1; and

15 detaching the workpiece from the base plate by heating the workpiece retainer at temperature T2 which is higher than temperature T1.

PATENT COOPERATION TREATY

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT



(PCT Article 36 and Rule 70)

|  |   |  |
|--|---|--|
| Applicant's or agent's file reference<br>NI008PCT  | <b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416) |  |
| International application No.<br>PCT/JP99/04662  | International filing date (day/month/year)<br>27/08/1999  | Priority date (day/month/year)<br>17/09/1998 |
| International Patent Classification (IPC) or national classification and IPC<br>C09J7/02 |   |  |
| Applicant<br>NITTA CORPORATION et al.  |   |  |

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 6 sheets, including this cover sheet.  
  
☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  
  
 These annexes consist of a total of 5 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☒ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

|   |  |
|---|--|
| Date of submission of the demand<br><br>12/04/2000  | Date of completion of this report<br><br>11. 12. 00  |
| Name and mailing address of the international preliminary examining authority:<br><br> European Patent Office<br>D-80298 Munich<br>Tel. +49 89 2399 - 0 Tx: 523656 epmu d<br>Fax: +49 89 2399 - 4465 | Authorized officer<br><br>Gordon, M<br><br>Telephone No. +49 89 2399 8299<br><br> |

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/JP99/04662

**I. Basis of the report**

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

**Description, pages:**

1-30 as originally filed

**Claims, No.:**

1-11 as received on 11/09/2000 with letter of 08/09/2000

**Drawings, sheets:**

1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).  
☐ the language of publication of the international application (under Rule 48.3(b)).  
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority in written form.  
☐ furnished subsequently to this Authority in computer readable form.  
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.  
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:  
☐ the claims, Nos.:



**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/JP99/04662

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

**III. Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non-obvious), or to be industrially applicable have not been examined in respect of:

☐ the entire international application.

☒ claims Nos. 2,6.

because:

☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):

☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

☒ the claims, or said claims Nos. 2,6 are so inadequately supported by the description that no meaningful opinion could be formed.

☐ no international search report has been established for the said claims Nos. .

2. A meaningful international preliminary examination report cannot be carried out due to the failure of the nucleotide and/or amino acid sequence listing to comply with the standard provided for in Annex C of the Administrative Instructions:

☐ the written form has not been furnished or does not comply with the standard.

☐ the computer readable form has not been furnished or does not comply with the standard.

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N) Yes: Claims 1,3-5,7-11

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT**

International application No. PCT/JP99/04662

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|                               |      |        |            |
|-------------------------------|------|--------|------------|
|                               | No:  | Claims |            |
| Inventive step (IS)           | Yes: | Claims |            |
|                               | No:  | Claims | 1,3-5,7-11 |
| Industrial applicability (IA) | Yes: | Claims | 1-11       |
|                               | No:  | Claims |            |

2. Citations and explanations  
**see separate sheet**

**VII. Certain defects in the international application**

The following defects in the form or contents of the international application have been noted:  
**see separate sheet**

**VIII. Certain observations on the international application**

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:  
**see separate sheet**

- 1). Certain of the amendments made do not meet the requirements of Art 34(2)b PCT.

Claims 2 and 6 define that the decrease in adhesiveness is based on the peeling force and the 90% reduction relates to the value at 25°C. Neither of these features are directly derivable from the application as filed. Accordingly these claims will not be further considered.

- 2). The application also includes a number of defects as regards both the completeness (Art 5 PCT) and clarity (Art 6 PCT) of the disclosure.

Page 10, line 29 ff and following pages indicate that certain characteristics, defined vaguely as "physicochemical properties" of the crystallisable polymer are necessary in order to achieve the desired aim of obtaining an adhesive with controllable temperature dependent properties. The description however fails to give any further details as to these characteristics. The inevitable conclusion is thus that while the examples do illustrate certain specific, operable embodiments, the disclosure taken as a whole is not such as to make available a self contained technical teaching capable of extension beyond the specific exemplified embodiments. Therefore the application fails to disclose the "invention" completely.

Coupled to this deficit is the fact that, inevitably the claims contain no restrictions which could be indicative of these necessary characteristics, with the consequence that the requirements of Art. 6 PCT are not met.

A further deficit arises with respect to the definition of the molecular weight of the side-chain polymer. A range is given, it is however not stated either in the description or in the claim to which molecular weight this refers. Hence the scope of the claim and the teaching of the description cannot be determined (Articles 5 and 6 PCT). In view of this also it cannot be with certainty established whether the tackifier is in fact distinguished from the pressure adhesive layer.

- 3). Regarding the substantive issues of novelty and inventive step, insofar as an analysis is possible, the closest prior art appears to be represented by the teaching of WO96/30163. This relates to a wafer retainer. As a wafer has in some way to be processed, i.e "worked", it is in the broadest sense, a "workpiece retainer", and hence falls within the scope of this term as employed in the present

application. The adhesive, as disclosed in examples 5 and 6 is an acrylate copolymer. Assuming that the tackifier is indeed a separate component, despite the inadequate definition thereof (See above), this would provide a distinguishing feature.

The fact, reported in the examples that the adhesive (intended to be) according to the claims loses adhesivity upon heating while that taught by D1 loses adhesivity upon cooling does not represent a further distinction but is in fact a consequence of the presence of the tackifier.

As taught by WO92/13901, in particular Table 1 page 28 and the discussion on page 30, lines 7ff, the addition of side chain crystallisable polymers as tackifier to pressure sensitive adhesives results in a temperature dependence of the adhesiveness. The precise nature of this depends on the molecular weight of the tackifier employed. Lower molecular weights lead to a loss of adhesivity upon heating, whereas higher molecular weights lead to a loss of adhesivity upon warming.

- 4). As may be derived from the second paragraph of point (3) above, it is known in the art that side chain crystallisable polymers serve as tackifiers for pressure sensitive adhesives. It is also known that these components endow the PSA with a temperature dependent adhesiveness control, and it is further taught how to select the tackifier in order to obtain a specific type of adhesivity profile (high or low temperature).

In view of this teaching, the subject matter claimed is considered to be an obvious development of the general teaching of D1 taking into account the additional information from D2, and hence no inventive step can be acknowledged for the subject matter of any claim.

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

|  |   |  |
|--|---|--|
| Applicant's or agent's file reference<br><b>NI008PCT</b> | <b>FOR FURTHER ACTION</b> see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below. |  |
| International application No.<br><b>PCT/JP 99/ 04662</b> | International filing date (day/month/year)<br><b>27/08/1999</b>   | (Earliest) Priority Date (day/month/year)<br><b>17/09/1998</b> |
| Applicant<br><b>NITTA CORPORATION et al.</b>             |   |  |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

**1. Basis of the report**

- a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

- b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

2. ☐ **Certain claims were found unsearchable** (See Box I).

3. ☐ **Unity of invention is lacking** (see Box II).

**4. With regard to the title,**

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

**5. With regard to the abstract,**

☒ the text is approved as submitted by the applicant.

☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the **drawings** to be published with the abstract is Figure No.

☐ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☒ because this figure better characterizes the invention.

2  
☐ None of the figures.

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 99/04662

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 C09J7/02 B24B37/04 B24B41/06 H01L21/68

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 C09J B24B H01L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| Y          | WO 96 30163 A (NITTA CORP ;ISHII HIDEYUKI (JP); SHIGETA YOSHITANE (JP))<br>3 October 1996 (1996-10-03)<br>page 16, line 22 -page 17, line 1<br>figure 2B  | 1-11                  |
| Y          | WO 92 13901 A (LANDEC LAB INC)<br>20 August 1992 (1992-08-20)<br>cited in the application<br>example 47<br>page 33, line 25 - line 26<br>claims 1-7,10,11 | 1-11                  |



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

## \* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance  
"E" earlier document but published on or after the International filing date  
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)  
"O" document referring to an oral disclosure, use, exhibition or other means  
"P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention  
"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  
"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.  
"&" document member of the same patent family

Date of the actual completion of the international search

5 January 2000

Date of mailing of the international search report

18/01/2000

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## INTERNATIONAL SEARCH REPORT

International Application No

PCT/JP 99/04662

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages   | Relevant to claim No. |
|------------|--|-----------------------|
| X          | WO 97 46631 A (MINNESOTA MINING & MFG)<br>11 December 1997 (1997-12-11)<br>abstract<br>page 8, line 28 -page 9, line 4<br>page 11, line 21 - line 25<br>page 17, line 10 - line 25<br>page 23, line 30 -page 24, line 1<br>figures 6A-C<br>page 32, line 5 - line 10<br>---- | 1,5,6,10              |
| A          | DATABASE WPI<br>Section Ch, Week 199810<br>Derwent Publications Ltd., London, GB;<br>Class A81, AN 1998-103894<br>XP002125949<br>& JP 09 208924 A (NITTA KK),<br>12 August 1997 (1997-08-12)<br>abstract<br>----   | 1-11                  |
| A          | PATENT ABSTRACTS OF JAPAN<br>vol. 1998, no. 11,<br>30 September 1998 (1998-09-30)<br>& JP 10 163135 A (DISCO ABRASIVE SYST<br>LTD), 19 June 1998 (1998-06-19)<br>abstract<br>-----   | 1-11                  |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/JP 99/04662

| Patent document<br>cited in search report |   | Publication<br>date | Patent fam<br>member(s) | Publication<br>date |
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| JP 9208924                                | A | 12-08-1997          | NONE                    |                     |
| JP 10163135                               | A | 19-06-1998          | NONE                    |                     |